MULTIMEDIA UNIVERSITY

TABLE NO | | |

STUDENT ID NO | | | | | | | | | | |

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023 (TERM ID 2220)

TSE3351 – SOFTWARE EVOLUTION AND MAINTENANCE

(All sections / Groups)

10 JULY 2023
9:00 a.m – 11:00 a.m
(2 Hours)

Question	Mark
A	
B	
C	
D	
Total	

Examiner 1 Signature: _____

Examiner 2 Signature: _____

Examiner 3 Signature: _____

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **10 printed pages** (including cover page).
2. Answer **ALL** questions in **SECTION A, SECTION B, SECTION C and SECTION D.** The distribution of the marks for each question is given.
3. Write all your answers in the **CLEARLY** in the specific answer box provided for each question. Submit this question paper at the end of the examination.

STRUCTURED QUESTIONS (50 MARKS)

SECTION A [12.5 MARKS]

Consider the explainable artificial intelligence (XAI) software system to perform an interpretive analysis of input data. They produce an approximation summary as an explanation relating inputs and outputs, without engaging the internal representations, attributes, and structures of the learning models. XAI is emerging as a common goal for data scientists, engineers, and AI (Artificial Intelligence) practitioners to deal with the problem of AI opacity (the quality of a lacking transparency) for the operation of learning models.

One source of variation of explanation summaries originates from the XAI operation. The major entities involved in XAI operations are datasets, a trained model, and XAI methods. An XAI method can be applied to the model prediction on each data sample. As a result, a set of explanation summaries are collected for the same prediction model.

Based on the above context, answer the following questions Q-A1 to Q-A5:

A1. How does a process of software evolution work for XAI?

(1 mark)

Answer

A2. What is software maintenance concerned with? Explain TWO reasons why software maintenance is important for the above-mentioned XAI.

(1.5 + 2 marks)

Answer

Continued...

A3. If a system such as XAI is used, it is never finished because it will always need to evolve. Why?

(1 mark)

Answer

A4. What are the THREE components that define software like XAI as proposed by McDermid? For each component, provide at least TWO examples.

(3 marks)

Answer

A5. Explain FOUR factors (with at least an example for each factor) that provide the motivation for software maintenance in XAI.

(4 marks)

Answer

Continued...

SECTION B [12.5 MARKS]

Consider a system called Sub-Events Detection on sOcial Media During Disasters (SEDOM-DD), for detecting and signaling subevents during disasters. Specifically, the designed system addresses two important issues: understanding whether a post is relevant to a disaster and discovering the subevents that occurred in the disaster area. SEDOM-DD performs these tasks in four main steps: 1) collecting posts that are potentially related to the disaster, 2) filtering posts to keep only the relevant ones, 3) enrichment data by using information contained in posts to increase the number of posts for which it is possible to estimate their geo-localization, and 4) using clustering techniques on geotagged relevant posts for detecting subevents.

Using 80% of relevant posts and 15% of geotagged posts, the system correctly detects the subevents and their location areas with an accuracy of approximately 85%. In all the other considered configurations, SEDOM-DD was able to detect subevents with high accuracy, revealing its effectiveness even when dealing with noisy data.

B1. Explain TWO reasons why configuration management in software development differs from configuration management in software maintenance for the abovementioned SEDOM-DD system.

(4 marks)

Answer

B2. What are the THREE main responsibilities of the management in SEDOM-DD change control?

(1.5 marks)

Answer

Continued...

B3a. What comprises a good software maintenance framework for the SEDOM-DD system? What does SPE classification stand for?

(0.5 + 1.5 marks)

Answer

B3b. Explain why the SPE classification scheme is useful in software evolution. What are the TWO qualities involving this SPE classification scheme?

(1 + 2 marks)

Answer

B4. Explain TWO factors that prevent SEDOM-DD to undertake domain analysis in using a novel approach such as the machine learning platform.

(2 marks)

Answer

Continued...

SECTION C (12.5 MARKS)

C1a. Describe the FOUR stages representation of the spiral model of the development process.

(2 marks)

Answer

C1b. Draw a diagram to show THREE spiral cycles, indicating the production process. On each of the THREE spiral cycle line, label the FOUR stages to represent as quadrants for Cycle 1-a, 1-b, 1-c, 1-d; Cycle 2-a, 2-b, 2-c, 2-d; and Cycle 3-a, 3-b, 3-c, and 3-d.

(3 marks)

Answer

Continued...

C2. To achieve the objectives of maintenance, a wide spectrum of change to the software product may be necessary. Explain why it is important to categorize software changes.

(2 marks)

Answer

C3. There are four types of software change. Define each of the following software change.

C3a. Corrective change.

(0.5 marks)

Answer

C3b. Adaptive change.

(0.5 marks)

Answer

C3c. Perfective change.

(0.5 marks)

Answer

C3d. Preventive change.

(1 mark)

Answer

Continued...

C4. Draw the software maintenance framework showing the relationship between the SIX components: User environment, Organizational environment, Maintenance, Process & Personnel, Software, and Operational environment.

(3 marks)

Answer

Continued...

SECTION D [12.5 MARKS]

From mobile applications tracking our health status to complex automated assistants that provide intervention solutions in case of need, research in the field of pervasive healthcare is thriving. (Pervasive refers to spreading widely throughout an area or a group of people). The impressive growth of data available for training models to recognize one's activities and changes in the behavior and condition combined with the widespread adoption of wearable devices, smartphones, and Internet of things systems provides a powerful tool for monitoring one's health-related behavior. For such systems to be successful, annotated data are required to design and train the underlying models used for activity and behavior recognition. This is true both for knowledge-based systems that rely on the annotation (also known as "ground truth") to design and later evaluate the system's performance, as well as for data-driven systems that use the annotated data to train a classifier able to infer the person's health state and needs.

Based on the above scenario, answer questions Q-D1 to Q-D3:

D1. RationaleNode and ModelElement classes are commonly found in a typical functionality implementation. Discuss how developers can make use of these classes to develop the abovementioned healthcare software systems. Subsequently, draw a class diagram to support your answer.

(3 + 3 marks)

Answer

Continued...

D2. Explain how the Source Code Control System (SCCS) can be used as part of software maintenance for the abovementioned software systems.

(2 marks)

Answer

D3. Based on Question D2, explain how changing software causes problems that require revision control in relation to SCCS use in a parallel development/maintenance environment, and explain how these problems can be overcome in other support tools.

(4.5 marks)

Answer

End of Page.